CLAIMS

1. An integrated circuit, configured to process microphone signals, where the integrated circuit comprises:
a preamplifier (306) with an amplifier section (301) which has a first input (ϕ) and a second input (ϕ^*) and an output (φ), and with a feedback filter network (Z1; Z1, Z1*, Z2) coupled between the output (φ; φ, φ^*) and the second input (ϕ'); where the first input (ϕ) to the amplifier section (301) has an input impedance which by means of the input impedance of the amplifier section is substantially isolated from the feedback network with respect to input impedance; and where the preamplifier has a frequency-gain transfer function which suppress low frequencies; and
an analogue-to-digital converter coupled to receive an anti-aliasing filtered input signal and providing a digital output signal.

2. An integrated circuit according to claim 1, where
the preamplifier (306) is configured to provide a differential output signal (φ, φ^*) by a first and a second amplifier section (301,302),
where the preamplifier (306) has a differential mode transfer function which comprises a band-pass characteristic (A_{DM}), and
where the preamplifier (306) comprises a feedback filter network (303, 304, 305) which establishes filter feedback paths (a-b; c-d) which couple outputs to respective inverting inputs of the amplifier sections (301, 302), and which establishes a filter interconnection path (a-c), which interconnects the inverting inputs.

3. An integrated circuit according to claim 1 or 2, where a lower cut-off frequency (F_{P1}) of the filter realized by the preamplifier (306) is located below the lower corner frequency of an audio band.

4. An integrated circuit according to any of claims 1 to 3, where the preamplifier (306) has a differential mode transfer function (A_{DM}) which comprises a band-pass characteristic with an upper cut-off frequency (F_{P3}; F_{P2}) located below half the sampling frequency (F_S) of the analogue-to-digital converter.

5. An integrated circuit according to any of claims 1 to 4, where the preamplifier (306) has a differential mode transfer function (A_{DM}) which comprises a band-pass characteristic, which has a nominal pass-band (F_{P1} - F_{P2}) and a gain plateau band (F_{Z2} - F_{P3}), where the nominal pass-band extends over audio band frequencies and where the gain plateau band extends over frequencies above the audio band up to an upper cut-off frequency (F_{P3}).

6. An integrated circuit according to any of claims 1 to 5, where the preamplifier (306) has a common-mode transfer function (A_{CM}) which comprises a low-pass characteristic.

7. An integrated circuit according to any of claims 1 to 6, where the preamplifier has a common-mode transfer function (A_{CM}) which comprises a stop-band characteristic ($F_{Z1'}$ - ; $F_{Z1'} - F_{Z2'}$), and where a flat gain response is provided for low frequencies (DC – $F_{P1'}$).

8. An integrated circuit according to any of claims 1 to 7, where the preamplifier has a common-mode transfer function (A_{CM}) and a differential mode transfer function (A_{DM}) which are configured such that its common-mode gain (A_{CM}) prevails at low frequencies (DC-$F_{P1'}$) whereas its differential mode gain (A_{DM}) prevails at audio band frequencies (F_{AL}-F_{AU}).

9. An integrated circuit according to any of claims 1 to 8, where additionally the common-mode gain (A_{CM}) prevails at frequencies above an upper cut-off frequency (F_{P2}, F_{P3}) of the band-pass characteristic.

10. An integrated circuit according to any of claims 1 to 9, where a phase-shifter (307) is cross-coupled between the output of a first amplifier section (301) and an input of a second amplifier section (302).

11. An integrated circuit according to any of claims 1 to 10, where a phase-shifter (307) is coupled between respective inputs (-) of the respective amplifier sections (301, 302).

12. An integrated circuit according to any of claims 1 to 11 where the preamplifier comprises a DC off-set circuit (907,908; 1001,1002) integrated with the feedback filter (Z1; Z1*,Z2) to provide a DC shift at the output of the preamplifier.

13. An integrated circuit according to any of claims 1 to 12 comprising a DC off-set circuit (907,908; 1001,1002) integrated with the feedback filter and configured to provide a differential mode DC shift at the output of the preamplifier.

14. An integrated circuit according to any of claims 1 to 13, where the analogue-to-digital converter comprises a sigma-delta modulator (103).

15. An integrated circuit according to claim 14, where the sigma-delta modulator (1302) comprises a switch-capacitor sampler (1307), which samples the differential signal (φ, φ^*) provided by the preamplifier (201) to provide a single ended input signal for the sigma-delta A/D conversion, and samples a DC voltage level ($V_{Ref\Sigma\Delta}$) such that the single ended input signal is superimposed on the sampled DC voltage level.

16. An integrated circuit according to claim 15, where the sampler comprises a summing amplifier (1301) which is an integrated portion of the sampler (1307) and the sigma-delta modulator loop.

17. An integrated circuit according to claim 16, where the summing amplifier (1301) is provided with an integration error feedback signal of the sigma-delta modulator via a first series capacitor (1303) and where the DC voltage level is provided to the summing amplifier (1301) via a second series capacitor (1306).

18. An integrated circuit according to any of claims 1 to 17, where the analogue-to-digital converter comprises a sigma-delta modulator, and where a DC off-set voltage level input to the sigma-delta modulator is chosen such that a low-frequent pulse input to and processed by the preamplifier (201) provides idle-mode tones above the audio band.

19. A microphone (108;202) comprising an integrated circuit as set forth in any of the above claims and a condenser microphone element (105) configured to provide a microphone signal, responsive to a sound pressure on the microphone element, to the input (ϕ) of the microphone preamplifier (201).

20. A microphone comprising an integrated circuit as set forth in any of the above claims and a MEMS microphone element to provide a microphone signal, responsive to a sound pressure on the MEMS microphone element, to the microphone preamplifier.